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Hatsuhiko Harashina

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EXAMINER

KOLLAS, ALEXANDER C

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/576,452

**Applicant(s)**

HARASHINA, HATSUHIKO

**Examiner**

ALEXANDER C. KOLLIAS

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 25-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/55/CE)  
Paper No(s)/Mail Date 20080808, 20080420
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_

**DETAILED ACTION**

***Election/Restrictions***

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-24, drawn to a polyacetal resin composition.

Group II, claim(s) 25-37, drawn to a process of producing a polyacetal resin composition.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the technical feature which is common to both groups, namely a polyacetal composition that has a formaldehyde emission inhibitor does not define a contribution over the prior art as evidenced by Yamamoto et al (US 5,886,139) , specifically see Col. 7 Lines 26-30 and Col 10, Lines 48-67 of the reference which discloses a polyacetal resin composition comprising hindered phenol stabilizers and a trioxane content of less than 3 wt % trioxane. Therefore the cited technical feature does not constitute a special technical feature and hence there is lack of unity between the cited groups.

2. During a telephone conversation with Ryan Davidson on 2/21/2009 a provisional election was made with traverse to prosecute the invention of Group I, claim 1-24. Affirmation of this election must be made by applicant in replying to this Office action. Claims 25-37 are

withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

3. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

#### ***Specification***

4. The use of the trademarks “ELVAMIDE 8063R”, “AMICURE VDH”, and “POLYPLANYLON 66” has been noted in this application. They should be capitalized wherever they appear and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

#### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 5-6 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claims 5-6 recite "a solvent being a poor solvent for the polyacetal resin" and "a poor solvent for the polyacetal resin and being a good solvent for trioxane", respectively, which renders the scope of the claims indefinite. It is unclear if the terms "good solvent" and "poor solvent" as applied to the polyacetal resin and trioxane are used to imply for example solubility as applied to trioxane and the polyacetal resin, or other physical properties. In the interests of compact prosecution, pending rectification of the terms "good solvent" and "poor solvent", these terms will be taken to mean water, alcohol (e.g., an alkyl alcohol such as methanol, ethanol, or propyl alcohol), ketone (e.g., a dialkyl ketone such as acetone), and ether (e.g., a dialkyl ether such as diethyl ether) as disclosed in the instant Specification.

8. Claim 16 recites "higher fatty acid or a derivative thereof" which renders the scope of the claim indefinite. It is not understood what is meant by a higher fatty acid. It is, for example, a fatty acid having more than 5 carbon atoms, more than 10 carbon atoms, etc? In the interests of compact prosecution pending rectification of the term "higher fatty acid", the higher fatty acid recited in the present claims will be taken to be mono- or di-fatty acid having not less than 10 as disclosed in the instant Specification.

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

11. Claims 1-5, 12, 16, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages).

Regarding claims 1-5, 12, 16-17, and 19-20, Yamamoto et al discloses a polyacetal copolymer comprising monomers such as trioxane as the principal monomer and co-monomers such as cyclic ethers or cyclic formals (Column 3, Lines 59-64, and Column 4, Lines 1-15). The amount of the un-reacted monomers in the compositions after polymerization is less than 3 wt % (Column 4, Lines 42-47). The residual monomers are removed by evaporation to control the residual monomers to a given amounts (Column 4, Lines 60-62). The reference discloses that the polyacetal resin is treated via heat melting treatment in the presence of a stabilizer such as hindered phenol anti-oxidants, hindered amine, benzotriazole compounds, and oxides of alkaline metals which may be used singly or in combination such as magnesium salts of higher fatty acid (Column 5, Lines 63-67, and Column 6, Lines 1-35). Although the reference does not explicitly disclose that the higher fatty acids and alkaline earth metal salts are processing and heat stabilizers, given that the reference discloses compounds identical to those utilized in the present

invention, it is clear that the disclosed compounds will function as heat and processing stabilizers as presently claimed.

Regarding the heat treatment recited in claim 5, reference discloses that the polymer is heat melted in the temperature range from the melting point of the polymer up to 250 degrees C (Column 6, Lines 24-35). Although the reference does not explicitly disclose that the trioxane content is reduced during heat-melting, it is the Examiner's position that the disclosed temperature range and process of heat-melting the polymer meet the presently claimed limitations drawn to reducing trioxane content reduced via heat treatment recited in claims 4-5. Evidence to support this position is found in the *Merck Index* which discloses that the boiling point of trioxane is 114.5 degrees (Page 9860, entry 9863). Given that the reference discloses that heat treatment of the copolymer occurs at a temperature range from the melting point of the polymer to 250 degrees C, it is clear that residual trioxane monomers will be removed.

Regarding the amounts of trioxane recited in claim 1-3, it is recognized that the present claims require the amount of trioxane content in ppm while the reference discloses trioxane content in weight percent, however it is the Examiner's position, absent evidence to the contrary, given the disclosed broad range of 3 wt % or less by Yamamoto, the amount disclosed by the reference meets the presently claimed amount of 100 ppm or less as presently claimed.

Regarding the amount of residual monomers disclosed by the reference, it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re*

Woodruff, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); In re Malagari, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

12. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Okawa et al (US 6,365,704) and Morishita et al (US 5,288,840).

Regarding claim 10, Yamamoto teaches all the claim limitations as set forth above. However, the reference does not disclose that the polyacetal resin composition comprises a polyacetal copolymer having terminal hemiformal group of not more than 1.2 mmol/kg.

Okawa et al discloses a polyacetal copolymer comprising trioxane and cyclic ether monomers as well as additives (Column 1, Lines 57-67, Column 2, Lines 46-67, Column 5, Lines 37-43) and a hemiformal terminal groups in the amount from 0 to 4 mmol/kg (Page 5, Lines 26-36). The reference discloses that when the amount is greater than 4 mmol/kg, problems such as foaming upon molding cause the decomposition of the polymer (Column 5, Lines 25-37). It is noted that the present claim recites “not more than 1.2 mmol/kg” which includes an amount of zero. Given that the reference discloses from 0 to 4 mmol/kg, the disclosed amount meets the limitations recited in the present claim.

Given that both Yamamoto et al and Okawa are drawn to polyacetal compositions comprising in light of the particular advantages provided by the use and control of the hemiformal terminal groups as taught by Okawa, it would therefore have been obvious to one of ordinary skill in the art to adjust the amount of hemiformal terminal end groups in the



compositions disclosed by Yamamoto in order to reduce foaming of the polyacetal polymer upon molding.

Modified Yamamoto discloses all the claim limitations as set forth above. However, the reference does not disclose that the polyacetal copolymer has terminal formyl group of not more than 1.2 mmol/kg. It is noted that in the present invention, the terminal formyl group (HCO-) may be determined by measurement of a terminal formyloxy or formate (HCOO-) group. Morishita et al discloses a polyacetal copolymer wherein the ratio of terminal formate to methylene groups as measured by infrared spectroscopy is less than 0.020. When the ratio is greater than 0.020 the stability of the heat and hot water resistance of the copolymer are deteriorated (Column 4, Lines 8-25).

Given that Yamamoto and Morishita are drawn to polyacetal compositions, in light of the particular advantages provided by the use and control of the terminal formyl groups disclosed by Morishita, it would therefore have been obvious to one of ordinary skill in the art to modify the amount of terminal formyl groups in the composition disclosed by Yamamoto et al in order to control heat and water resistance of the polyacetal resin.

13. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Fleischer et al (US 5,587,449) and Tanimura et al (US 2001/0007006).

Regarding claim 11, Yamamoto teaches all the claim limitations as set forth above. However, the reference does not disclose that the copolymer has 0.5 or less of unstable terminal groups.

Fleischer et al discloses a polyacetal resin wherein the unstable chain end a degraded down to 0.01 to 1 % in the presence of residual monomers, with residual monomers and impurities in the resin are remove by extraction (Abstract, Column 1, Lines 54-67), while Tanimura discloses that in order to prevent lowering of the molecular weight and formation of the unstable terminal group during the polymerization it is necessary to make concentrations of impurities containing active hydrogen such as water, methyl alcohol, formic acid, etc. in trioxane or co-monomers as low as possible (Page 5, [0075]).

Given that Yamamoto discloses a polyacetal resin, given that Fleischer et al discloses a polyacetal resin composition comprising 0.01 to 1 % unstable terminal ends and removal of impurities and Tanimura discloses that removal of impurities during polymerization controls the molecular weight and the amount of unstable terminal end, it would have been obvious to one of ordinary skill in the art, to control the polymerization of the polyacetal resin disclosed by Yamamoto in order to reduce the amount of unstable terminal ends and control the molecular weight of the polyacetal resin.

It is recognized that the present claims require the amount of unstable terminal ends in wt % and the reference discloses the percentage of unstable end, however it is the Examiner's position, absent evidence to the contrary, given the disclosed broad range of 0.01 to 1 % disclosed by Fleischer et al, that the amount disclosed by the reference meets the presently claimed amount of less than 0.5 wt %.

14. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Harashina (US 2003/0158301).

Regarding claims 13-15, Yamamoto et al teaches all the claim limitations as set forth above. However, Yamamoto et al does not disclose a composition comprising a formaldehyde emission inhibitor.

Harashina discloses a polyacetal resin composition comprising a glyoxyldiureide compounds, metal salts of glyoxyldiureide, and a basic nitrogen compounds such as melamine, melamine resin, polyamines or low molecular compounds such as hydrazine, urea compounds, guanidine compounds, and polycarboxylic acid hydrazine compounds (Page 2, [0014], Page 2 [0026]-[0028]). The reference discloses that the glyoxyldiureide compounds along or in combination with the basic nitrogen compounds discussed above results improvement in the process stability of the polyacetal resin and suppression of formaldehyde emission (Page 2, [0022]).

Given that both Yamamoto et al and Harashina are drawn to polyoxymethylene resins, given that Yamamoto et al does not explicitly prohibit other ingredients, in light of the particular advantages provided by the use and control of the glyoxyldiureide and basic nitrogen compounds as taught by Harashina, it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by Yamamoto et al in order to improve polyacetal resin processes stability and formaldehyde emission.

15. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Harashina et al (US 2003/0036591 hereafter referred to as US '591) and Harashina (US 2003/0158301 hereafter referred to as US '301).

Regarding claim 18, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not explicitly disclose the amounts of hindered phenolic antioxidant, processing stabilizers, and heat stabilizers presently recited in claim 18.

Harashina (US '591) discloses a polyacetal composition comprising hindered phenol antioxidants in the amount of 0.005 to 3 parts by weight, a processing stabilizer in the amount from 0.05 to 3 parts by weight, and heat stabilizer in the amount from 0.001 to 5 parts by weight (Page 2, [0018], Page 5, [0040], Page 5, [0050], Page 6, [0063], Page 7, [0065], and Page 8, [0093]). It is noted that the amounts of antioxidants, processing stabilizers, and heat stabilizers disclosed by the reference are with the amounts presently recited in claim 18.

Regarding the amounts of the stabilizers disclosed by Harashina (US '591), it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); *In re Malagari*, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

Modified Yamamoto teaches all the claim limitations as set forth above. However, Yamamoto does not disclose that the composition comprises 0.001 to 20 parts by weight of a formaldehyde emission inhibitor

Harashina discloses (US '301) discloses formaldehyde emission inhibitor compounds such as glyoxyldiureide compounds which comprise 0.01 to 10 parts by weight per 100 parts by weight polyacetal resin. The reference discloses that if the amount is less than 0.01 parts by weight, it is difficult to suppress formaldehyde emission, while amounts greater than 10 parts by weight adversely affect moldability and color tone of final products (Page 3, [0026]).

Given that both modified Yamamoto and Harashina (US '301) are drawn to polyoxymethylene resins, in light of the particular advantages provided by the use and control of the glyoxyldiureide compounds and basic nitrogen compounds as taught by Harashina (US '301), it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by Yamamoto in order to improve polyacetal resin processes stability and formaldehyde emission.

16. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Kim et al (US 2001/0049415).

Regarding claim 21, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not disclose a polyacetal composition comprising an impact resistance improver.

Kim et al discloses a polyacetal resin composition, additives such as antioxidants, light stabilizers (Page 3 [0052]), thermoplastic polyester and thermoplastic polyurethane (Page 1, [0015]-[0016], Page 2 [0017]-[0018], [0029]-[0030], and [0038]-[0039]). The reference discloses that compositions comprising polyoxymethylene, thermoplastic polyester, and thermoplastic polyurethane have improved processibility, thermal stability, impact resistance and tensile elongation (Page 1, [0013]).

Given that both Yamamoto et al and Kim et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the thermoplastic polyurethane and polyester as taught by Kim et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by Yamamoto et al in order to obtain a polyoxymethylene resin composition which has improved impact resistance and tensile elongation.

17. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Katsumata (US 5,190,828)

Regarding claim 22, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not disclose a polyacetal composition comprising a gloss control agent.

Katsumata et al discloses a polyacetal resin compositions comprising an acrylic modified silicone resin and weather light stabilizers (Abstract, Column 2, Lines 35-55, Column 6, Lines

8-29). The reference discloses that the combination of polyacetal resin and the acrylic resin exhibits lower surface gloss and a high-grade appearance (Column 4, Lines 48-55).

Given that both Yamamoto et al and Katsumata et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the acrylic resins as taught by Katsumata et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by Yamamoto et al in order to obtain a polyoxymethylene resin composition which has uniformly reduced surface gloss.

18. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Tajima (US 5,854,324)

Regarding claim 23, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not disclose a polyacetal composition comprising an agent for improving the sliding property of the composition.

Tajima et al discloses a polyacetal resin compositions comprising stabilizers and a modified olefinic polymer (Column 1, Lines 50-67 and Column 8, Lines 25-29). The reference discloses that the combination of polyacetal resin and the olefinic polymers results in resin compositions which have excellent general properties and sliding performances (Column 1, Lines 50-56).

Given that both Yamamoto et al and Tajima et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use

and control of the olefinic polymer as taught by Tajima et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by Yamamoto et al in order to obtain a polyoxymethylene resin composition which has improved material and sliding properties.

19. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,844,059) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-5, 12, 16-17, and 19-20 above and further in view of Harashina (US 2003/0158301).

Regarding claim 24, Yamamoto teaches all the claim limitations as set forth above. However, Yamamoto does not disclose a pellet of polyacetal resin comprising a formaldehyde emission inhibitor.

Harashina discloses a polyacetal resin in the form of a pellet which formaldehyde emission inhibitor compounds such as glyoxyldiureide and basic nitrogen compounds which not only inhibit formaldehyde emission but also provide a polyacetal resin with improved process stability (Page 2, [0013]-[0016], Page 3, [0026], Page 5, [0054]).

Given that both Yamamoto and Harashina are drawn to polyoxymethylene resins comprises stabilizers, in light of the particular advantages provided by the use and control of the glyoxyldiureide compounds and basic nitrogen compounds as taught by Harashina, it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by Yamamoto in order to improve polyacetal resin processes stability and inhibit formaldehyde emission.



20. Claims 1-5, 7, 12, 16-17, and 19-20, are rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/0036591).

Regarding claims 1-3, 12, 17, and 19-20, Arnoldi discloses a polyacetal homo- or co-polymer which has a trioxane content of less than 2 wt % (Column 3, Lines 55-67 and Column 4 Lines 13-50 and Column 6, Lines 36-48).

It is recognized that the present claims require the amount of trioxane content in ppm and the reference discloses trioxane content in weight percent, however it is the Examiner's position, absent evidence to the contrary, given the disclosed broad range of 2 wt % of less by Arnoldi, that the amount disclosed by the reference meets the presently claimed amount of 100 ppm or less.

Regarding the amount of trioxane disclosed by the reference, it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); *In re Malagari*, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

Arnoldi discloses all the claim limitations as set forth above. Additionally, the reference discloses that it is known to add stabilizers to polyoxymethylene resin (Column 1, Lines 25-37). However, the reference does not disclose the stabilizers presently recited in claim 1.

Harashina disclose a polyoxymethylene resin composition comprising additives such as hindered phenol (antioxidant), processing, and heat stabilizers such as long-chain or higher fatty

acid. i.e., comprising not less than 10 carbon atoms (Page 2, [0015]-[0016] and [0018], Page 3, [0020]-[0027], Page 4, [0029]-[0031], Page 5, [0050]-[0052], and Page 6, [0063]). The reference discloses that the combination of stabilizers improve weather-(light)-resistance of the resin as well reduced formaldehyde emissions (Page 1 [0007]-[0009])

Given that both Arnoldi and Harashina are drawn to polyoxymethylene resins, given that Arnoldi does not explicitly prohibit other ingredients, in light of the particular advantages provided by the use and control of the stabilizers as taught by Harashina, it would therefore have been obvious to one of ordinary skill in the art to include such stabilizers in the composition disclosed by Arnoldi with a reasonable expectation of success.

Regarding claims 4-5, and 7, modified Arnoldi teaches all the claim limitations as set forth above. Additionally, Arnoldi discloses that the trioxane content is reduced by a gaseous medium at a temperature range of 114 degrees C to the softening point of the resin comprising at least 10 wt % super heated water vapor (Column 6, Lines 37-48 and Lines 66-67 and Column 7, Lines 1-13).

21. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/0036591) as applied to claims 1-5, 7, 12, 16-17, and 19-20 and further in view of Okawa et al (US 6,365,704) and Morishita et al (US 5,288,840).

Regarding claim 10, Arnoldi teaches all the claim limitations as set forth above. However, the reference does not disclose that the polyacetal resin composition comprises a polyacetal copolymer having terminal hemiformal group of not more than 1.2 mmol/kg.

Okawa et al discloses a polyacetal copolymer comprising trioxane and cyclic ether monomers as well as additives (Column 1, Lines 57-67, Column 2, Lines 46-67, Column 5, Lines 37-43) and a hemiformal terminal groups in the amount from 0 to 4 mmol/kg (Page 5, Lines 26-36). The reference discloses that when the amount is greater than 4 mmol/kg, problems such as foaming upon molding cause the decomposition of the polymer (Column 5, Lines 25-37). It is noted that the present claim recites "not more than 1.2 mmol/kg" which includes an amount of zero. Given that the reference discloses from 0 to 4 mmol/kg, the disclosed amount meets the limitations recited in the present claim.

Given that both modified Arnoldi and Okawa are drawn to polyacetal compositions comprising in light of the particular advantages provided by the use and control of the hemiformal terminal groups as taught by Okawa, it would therefore have been obvious to one of ordinary skill in the art to adjust the amount of hemiformal terminal end groups in the compositions disclosed by modified Arnoldi in order to reduce foaming of the polyacetal polymer upon molding.

Modified Arnoldi discloses all the claim limitations as set forth above. However, the reference does not disclose that the polyacetal copolymer has terminal formyl group of not more than 1.2 mmol/kg. It is noted that in the present invention, the terminal formyl group (HCO-) may be determined by measurement of a terminal formyloxy or formate (HCOO-) group. Morishita et al discloses a polyacetal copolymer wherein the ratio of terminal formate to

methylene groups as measured by infrared spectroscopy is less than 0.020. When the ratio is greater than 0.020 the stability of the heat and hot water resistance of the copolymer are deteriorated (Column 4, Lines 8-25).

Given that modified Arnoldi and Morishita are drawn to polyacetal compositions and given that the , in light of the particular advantages provided by the use and control of the terminal formyl groups disclosed by Morishita, it would therefore have been obvious to one of ordinary skill in the art to modify the amount of terminal formyl groups in the composition disclosed by modified Arnoldi in order to control heat and water resistance of the polyacetal resin.

22. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/0036591) as applied to claims 1-5, 7, 12, 16-17, and 19-20 and further in view of Fleischer et al (US 5,587,449) and Tanimura et al (US 2001/0007006).

Regarding claim 11, modified Arnoldi teaches all the claim limitations as set forth above. However, the reference does not disclose that the copolymer has 0.5 or less of unstable terminal groups.

Fleischer et al discloses a polyacetal resin wherein the unstable chain end a degraded down to 0.01 to 1 % in the presence of residual monomers, with residual monomers and impurities in the resin are remove by extraction (Abstract, Column 1, Lines 54-67), while Tanimura discloses that in order to prevent lowering of the molecular weight and formation of the unstable terminal group during the polymerization it is necessary to make concentrations of

impurities containing active hydrogen such as water, methyl alcohol, formic acid, etc. in trioxane or co-monomers as low as possible (Page 5, [0075]).

Given that modified Arnoldi discloses a polyacetal resin, and given that Fleischer et al discloses a polyacetal resin composition comprising 0.01 to 1 % unstable terminal ends and removal of impurities and Tanimura discloses that removal of impurities during polymerization controls the molecular weight and the amount of unstable terminal end, it would have been obvious to one of ordinary skill in the art, to control the polymerization of the polyacetal resin disclosed by modified Arnoldi in order to reduce the amount of unstable terminal ends and control the molecular weight of the polyacetal resin.

23. Claims 13-15, 18, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/0036591 hereafter referred to as US '591) as applied to claims 1-5, 7, 12, 16-17, and 19-20 and further in view of Harashina (US 2003/0158301 hereafter referred to as US '301).

Regarding claims 13-15, modified Arnoldi teaches all the claim limitations as set forth above. However, Arnoldi does not disclose a composition comprising a formaldehyde emission inhibitor.

Harashina (US '301) discloses a polyacetal resin composition comprising a glyoxyldiureide compounds, metal salts of glyoxyldiureide and a basic nitrogen compounds such as melamine, melamine resin, polyamines or low molecular compounds such as hydrazine, urea compounds, guanidine compounds, polycarboxylic acid hydrazine compounds (Page 2, [0014], Page 2 [0026]-[0028]). The reference discloses that the glyoxyldiureide compounds along or in

combination with the basic nitrogen compounds discussed above results in improvement of the process stability of the polyacetal resin and suppression of formaldehyde emission (Page 2, [0022]).

Given that both modified Arnoldi and Harashina (US '301) are drawn to polyoxymethylene resins, given that Arnoldi does not explicitly prohibit other ingredients, in light of the particular advantages provided by the use and control of the glyoxyldiureide and basic nitrogen compounds as taught by Harashina (US '301), it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by modified Arnoldi in order to improve polyacetal resin processes stability and formaldehyde emission.

Regarding claim 18, modified Arnoldi teaches all the claim limitations as set forth above. However, Arnoldi does not disclose the stabilizers and amount thereof as presently recited in claim 18.

Harashina (US '591) discloses a polyacetal composition comprising hindered phenol antioxidants in the amount of 0.005 to 3 parts by weight, a processing stabilizer in the amount from 0.05 to 3 parts by weight, and heat stabilizer which includes basic nitrogen compounds in the amount from 0.001 to 5 parts by weight (Page 2, [0018], Page 5, [0040], Page 5, [0050], Page 6, [0063], Page 7, [0065], and Page 8, [0093]). It is noted that the amounts of antioxidants, processing stabilizers, and heat stabilizers disclosed by the reference are with the amounts presently recited in claim 18.

Harashina discloses (US '301) discloses formaldehyde emission inhibitors compounds such as glyoxyldiureide compounds which comprises 0.01 to 10 parts by weight per 100 parts by weight polyacetal resin. The reference discloses that if the amount is less than 0.01 parts by weight, it is difficult to suppress formaldehyde emission, while amounts greater than 10 parts by weight moldability and color tone of final products are adversely affected (Page 3, [0026]).

Given that both Arnoldi and Harashina (US '301) are drawn to polyoxymethylene resins, given that Arnoldi does not explicitly prohibit other ingredients, in light of the particular advantages provided by the use and control of the glyoxyldiureide compounds and basic nitrogen compounds as taught by Harashina (US '301), it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by Arnoldi in order to improve polyacetal resin process stability and formaldehyde emission.

Regarding claim 24, modified Arnoldi teaches all the claim limitations as set forth above. However, Arnoldi does not disclose a pellet of polyacetal resin comprising a formaldehyde emission inhibitor.

Harashina discloses (US '301) discloses a polyacetal resin in the form of a pellet which formaldehyde emission inhibitor compounds such as glyoxyldiureide compounds and basic nitrogen compounds which not only inhibit formaldehyde emission but also provides a polyacetal resin with improved process stability (Page 2, [0013]-[0016], Page 3, [0026], Page 5, [0054]).

Given that both modified Arnoldi and Harashina (US '301) are drawn to polyoxymethylene resins comprising stabilizers, in light of the particular advantages provided by

the use and control of the glyoxyldiureide and basic nitrogen compounds as taught by Harashina (US '301), it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by modified Arnoldi in order to improve polyacetal resin processes stability and inhibit formaldehyde emission.

24. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/00365910 as applied to claims 1-5, 7, 12, 16-17, and 19-20 and further in view of Kim et al (US 2001/0049415)

Regarding claim 21, modified Arnoldi teaches all the claim limitations as set forth above. However, Arnoldi does not disclose a polyacetal composition comprising an impact resistance improver

Kim et al discloses a polyacetal resin composition, additives such as antioxidants, light stabilizers (Page 3 [0052]), thermoplastic polyester, and thermoplastic polyurethane (Page 1, [0015]-[0016], Page 2 [0017]-[0018], [0029]-[0030], and [0038]-[0039]). The reference discloses that the composition comprising polyoxymethylene, thermoplastic polyester and thermoplastic polyurethane have improved processibility, thermal stability, impact resistance, and tensile elongation (Page 1, [0013]).

Given that both modified Arnoldi and Kim et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the thermoplastic polyurethane and polyester as taught by Kim et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition



disclosed by modified Arnoldi in order to obtain a polyoxymethylene resin composition which has improved impact resistance and tensile elongation.

25. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/00365910 as applied to claims 1-5, 7, 12, 16-17, and 19-20 and further in view of Katsumata (US 5,190,828)

Regarding claim 22, modified Arnoldi teaches all the claim limitations as set forth above. However, Arnoldi does not disclose a polyacetal composition comprising a gloss control agent.

Katsumata et al discloses a polyacetal resin compositions comprising an acrylic modified silicone resin and weather light stabilizers (Abstract, Column 2, Lines 35-55, Column 6, Lines 8-29). The reference discloses that the combination of polyacetal resin and the acrylic resin exhibits lower surface gloss and a high-grade appearance (Column 4, Lines 48-55).

Given that both modified Arnoldi and Katsumata et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the acrylic resins as taught by Katsumata et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by modified Arnoldi in order to obtain a polyoxymethylene resin composition which has uniformly reduced surface gloss.

26. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arnoldi et al (US 5,541,284) in view of Harashina et al (US 2003/00365910 as applied to claims 1-5, 7, 12, 16-17, and 19-20 and further in view of Tajima (US 5,854,324)

Regarding claim 23, modified Arnoldi teaches all the claim limitations as set forth above. However, Arnoldi does not disclose a polyacetal composition comprising an agent for improving the sliding property of the composition.

Tajima et al discloses a polyacetal resin compositions comprising a modified olefinic polymer and stabilizers (Column 1, Lines 50-67 and Column 8, Lines 25-29). The combination of polyacetal resin and the olefinic polymers results in resin compositions having excellent general properties and sliding performances (Column 1, Lines 50-56).

Given that both modified Arnoldi and Tajima et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the olefinic polymer as taught by Tajima et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by modified Arnoldi in order to obtain a polyoxymethylene resin composition which has improved material and sliding properties.

27. Claims 1-6, 8-9, 12, 16-17, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages).

Regarding claims 1-6, 8-9, 12, 16-17, and 19-20, Yamamoto et al discloses a polyacetal copolymer comprising monomers such as trioxane as the principal monomer and co-monomers such as cyclic ethers or cyclic formals (Column 5, Lines 26-60). The amount of the un-reacted monomers in the composition after polymerization is less than 3 wt % (Column 7, Lines 25-33). The residual monomers are removed by evaporation to control the residual monomers to a given

amounts (Column 7, Lines 45-67 and Column 8, Lines 1-29). The reference discloses that the polyacetal resin is treated via heat melting treatment in the presence of a stabilizer such as hindered phenol anti-oxidants, hindered amine, benzotriazole compounds, oxides of alkaline metals, and higher fatty acid salts and oxides of alkaline earth metals which may be used singly or in combination (Column 10, Lines 48-67 and Column 11, Lines 1-15). The heat treatment is carried out in the temperature range from the melting point of the polymer up to 250 degrees C (Column 11, Lines 20-31).

Although the reference does not explicitly disclose that the trioxane content is reduced during heat-melting, it is the Examiner's position that the disclosed temperature range and process of heat-melting the polymer meet the presently claimed limitations drawn to reducing trioxane content reduced via heat treatment recited in claims 4-5. Evidence to support this position is found in the *Merck Index* which discloses that the boiling point of trioxane is 114.5 degrees C (Page 9860, entry 9863). Given that the reference discloses that heat treatment of the copolymer occurs at a temperature range from the melting point of the polymer to 250 degrees C, it is clear that residual trioxane monomers will be removed.

Furthermore, the reference discloses a method of deactivating the catalyst used in the preparation of the polymer comprising a solvent such as water or organic solvents such as methanol and ethanol, ketones, such as acetone, or aqueous solutions of the above organic solvents (Column 10, Lines 1-14). The reference discloses that the inactivating treatment is from 20 to 120 degrees C and comprises mixing the solvent mixture with the crude polymer (Column 10, Lines 32-33). The reference discloses that a basic nitrogen compound such as ammonia is used as an inactivation agents are used to inactivate the catalyst (Column 9, Lines 15-20, and

Lines 33-67). It is the examiner's position that the solvents disclosed by the reference meet the limitations drawn to a good solvent for trioxane and a poor solvent from the resin as recited in the present claims given that the reference discloses solvents identical to those utilized in the present invention

Although the reference does not explicitly disclose that the trioxane content is reduced during the catalyst inactivation process, it is the Examiner's position that the disclosed temperature range and process of catalyst inactivation meets the presently claimed limitations drawn to reducing trioxane content reduced via solvent treatment recited in claims 5-6 and 8-9. Evidence to support this position is found in the *Merck Index* which discloses that trioxane is soluble in water, alcohols, ketones, and alcohols (Page 9860, entry 9863). Given that the reference discloses that solvent treatment of the polyacetal copolymer, it is clear that residual trioxane monomers will be removed.

It is recognized that the present claims require the amount of trioxane content in ppm while the Yamamoto discloses trioxane content in weight percent, it is the Examiner's position, absent evidence to the contrary, given the disclosed broad range of 3 wt % of less by Yamamoto, the amount disclosed by the reference meets the presently claimed amount of 100 ppm or less.

Regarding the temperature range disclosed by the reference, it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir 2005); *In re Peterson*, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); *In re Woodruff*, 919

F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); In re Malagari, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

Regarding the amount of residual monomers disclosed by the reference, it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See In re Harris, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed. Cir 2005); In re Peterson, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); In re Woodruff, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); In re Malagari, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

28. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Okawa et al (US 6,365,704) and Morishita et al (US 5,288,840).

Regarding claim 10, Yamamoto teaches all the claim limitations as set forth above. However, the reference does not disclose that the polyacetal resin composition comprises a polyacetal copolymer having terminal hemiformal group of not more than 1.2 mmol/kg.

Okawa et al discloses a polyacetal copolymer comprising trioxane and cyclic ether monomers as well as additives (Column 1, Lines 57-67, Column 2, Lines 46-67, Column 5, Lines 37-43) and a hemiformal terminal groups in the amount from 0 to 4 mmol/kg (Page 5, Lines 26-36). The reference discloses that when the amount is greater than 4 mmol/kg, problems such as foaming upon molding cause the decomposition of the polymer (Column 5, Lines 25-37).

It is noted that the present claim recites “not more than 1.2 mmol/kg” which includes an amount of zero. Given that the reference discloses from 0 to 4 mmol/kg, the disclosed amount meets the limitations recited in the present claim.

Given that both Yamamoto et al and Okawa are drawn to polyacetal compositions comprising in light of the particular advantages provided by the use and control of the hemiformal terminal groups as taught by Okawa, it would therefore have been obvious to one of ordinary skill in the art to adjust the amount of hemiformal terminal end groups in the compositions disclosed by Yamamoto in order to reduce foaming of the polyacetal polymer upon molding.

Modified Yamamoto discloses all the claim limitations as set forth above. However, the reference does not disclose that the polyacetal copolymer has terminal formyl group of not more than 1.2 mmol/kg. It is noted that in the present invention, the terminal formyl group (HCO-) may be determined by measurement of a terminal formyloxy or formate (HCOO-) group.

Morishita et al discloses a polyacetal copolymer wherein the ratio of terminal formate to methylene groups as measured by infrared spectroscopy is less than 0.020. When the ratio is greater than 0.020 the stability of the heat and hot water resistance of the copolymer are deteriorated (Column 4, Lines 8-25).

Given that Yamamoto and Morishita are drawn to polyacetal compositions and given that the , in light of the particular advantages provided by the use and control of the terminal formyl groups disclosed by Morishita, it would therefore have been obvious to one of ordinary skill in the art to modify the amount of terminal formyl groups in the composition disclosed by Yamamoto et al in order to control heat and water resistance of the polyacetal resin.

29. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Fleischer et al (US 5,587,449) and Tanimura et al (US 2001/0007006).

Regarding claim 11, Yamamoto teaches all the claim limitations as set forth above. However, the reference does not disclose that the copolymer has 0.5 or less of unstable terminal groups.

Fleischer et al discloses a polyacetal resin wherein the unstable chain end a degraded down to 0.01 to 1 % in the presence of residual monomers, with residual monomers and impurities in the resin are remove by extraction (Abstract, Column 1, Lines 54-67). While Tanimura discloses that in order to prevent lowering of the molecular weight and formation of the unstable terminal group during the polymerization, it is necessary to make concentrations of impurities containing active hydrogen such as water, methyl alcohol, formic acid, etc. in trioxane or co-monomers as low as possible (Page 5, [0075]).

It is recognized that the present claims require the amount of unstable terminal ends in wt % and the reference discloses the percentage of unstable end, however it is the Examiner's position, absent evidence to the contrary, given the disclosed broad range of 0.01 to 1 % disclosed by Fleischer et al, that the amount disclosed by the reference meets the presently claimed amount of less than 0.5 wt %.

Given that Yamamoto discloses a polyacetal resin, given that Fleischer et al discloses a polyacetal resin composition comprising 0.01 to 1 % unstable terminal ends and removal of

impurities and Tanimura discloses that removal of impurities during polymerization controls the molecular weight and the amount of unstable terminal end, it would have been obvious to one of ordinary skill in the art, to control the polymerization of the polyacetal resin disclosed by Yamamoto in order to reduce the amount of unstable terminal ends and control the molecular weight of the polyacetal resin.

30. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Harashina (US 2003/0158301).

Regarding claims 13-15, Yamamoto et al teaches all the claim limitations as set forth above. However, Yamamoto et al does not disclose a composition comprising a formaldehyde emission inhibitor.

Harashina discloses a polyacetal resin composition comprising a glyoxyldiureide compounds, metal salts of glyoxyldiureide and basic nitrogen compounds such as melamine, melamine resin, polyamines or low molecular compounds such as hydrazine, urea compounds, guanidine compounds, and polycarboxylic acid hydrazine compounds (Page 2, [0014], Page 2 [0026]-[0028]). The reference discloses that the glyoxyldiureide compounds along or in combination with the basic nitrogen compounds discussed above results improvement in the process stability of the polyacetal resin and suppression of formaldehyde emission (Page 2, [0022]).

Given that both Yamamoto et al and Harashina are drawn to polyoxymethylene resins, given that Yamamoto et al does not explicitly prohibit other ingredients, in light of the particular



advantages provided by the use and control of the glyoxyldiureide compounds and basic nitrogen compounds as taught by Harashina, it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by Yamamoto et al in order to improve polyacetal resin processes stability and formaldehyde emission.

31. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Harashina et al (US 2003/0036591 hereafter referred to as US '591) and Harashina (US 2003/0158301 hereafter referred to as US '301).

Regarding claim 18, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not explicitly disclose the amounts of hindered phenolic antioxidant, processing stabilizers, and heat stabilizers presently recited in claim 18.

Harashina (US '591) discloses a polyacetal composition comprising hindered phenol antioxidants in the amount of 0.005 to 3 parts by weight, a processing stabilizer in the amount from 0.05 to 3 parts by weight, and heat stabilizer in the amount from 0.001 to 5 parts by weight (Page 2, [0018], Page 5, [0040], Page 5, [0050], Page 6, [0063], Page 7, [0065], and Page 8, [0093]). It is noted that the amounts of antioxidants, processing stabilizers, and heat stabilizers disclosed by the reference are with the amounts presently recited in claim 18.

Regarding the amounts of the stabilizers disclosed by Harashina (US '591), it is well settled that where the prior art describes the components of a claimed compound or compositions in concentrations within or overlapping the claimed concentrations a prima facie case of obviousness is established. See *In re Harris*, 409 F.3d 1339, 1343, 74 USPQ2d 1951, 1953 (Fed.

Cir 2005); In re Peterson, 315 F.3d 1325, 1329, 65 USPQ 2d 1379, 1382 (Fed. Cir. 1997); In re Woodruff, 919 F.2d 1575, 1578 16 USPQ2d 1934, 1936-37 (CCPA 1990); In re Malagari, 499 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974).

Modified Yamamoto teaches all the claim limitations as set forth above. However, Yamamoto does not disclose that the composition comprises 0.001 to 20 parts by weight of a formaldehyde emission inhibitor

Harashina discloses (US '301) discloses formaldehyde emission inhibitor compounds such as glyoxyldiureide compounds which comprises 0.01 to 10 parts by weight per 100 parts by weight polyacetal resin. The reference discloses that if the amount is less than 0.01 parts by weight, it is difficult to suppress formaldehyde emission, while amounts greater than 10 parts by weight moldability and color tone of final products are adversely affected (Page 3, [0026]).

Given that both modified Yamamoto and Harashina (US '301) are drawn to polyoxymethylene resins, in light of the particular advantages provided by the use and control of the glyoxyldiureide compounds and basic nitrogen compounds as taught by Harashina (US '301), it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the composition disclosed by Yamamoto in order to improve polyacetal resin processes stability and formaldehyde emission.

32. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Kim et al (US 2001/0049415)

Regarding claim 21, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not disclose a polyacetal composition comprising an impact resistance improver

Kim et al discloses a polyacetal resin composition, additives such as antioxidants, light stabilizers (Page 3 [0052]), thermoplastic polyester and thermoplastic polyurethane (Page 1, [0015]-[0016], Page 2 [0017]-[0018], [0029]-[0030], and [0038]-[0039]). The reference discloses that the composition comprising polyoxymethylene, thermoplastic polyester and thermoplastic polyurethane have improved processibility, thermal stability, impact resistance, and tensile elongation (Page 1, [0013]).

Given that both Yamamoto et al and Kim et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the thermoplastic polyurethane and polyester as taught by Kim et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by Yamamoto et al in order to obtain a polyoxymethylene resin composition which has improved impact resistance and tensile elongation.

33. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Katsumata (US 5,190,828)

Regarding claim 22, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not disclose a polyacetal composition comprising a gloss control agent.

Katsumata et al discloses a polyacetal resin compositions comprising an acrylic modified silicone resin and weather light stabilizers (Abstract, Column 2, Lines 35-55, Column 6, Lines 8-29). The reference discloses that the combination of polyacetal resin and the acrylic resin exhibits lower surface gloss and a high-grade appearance (Column 4, Lines 48-55).

Given that both Yamamoto et al and Katsumata et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the acrylic resins as taught by Katsumata et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by Yamamoto et al in order to obtain a polyoxymethylene resin composition which has uniformly reduced surface gloss.

34. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Tajima (US 5,854,324)

Regarding claim 23, Yamamoto et al teaches all the claim limitations as set forth above. However, the reference does not disclose a polyacetal composition comprising an agent for improving the sliding property of the composition.

Tajima et al discloses a polyacetal resin compositions comprising a modified olefinic polymer and stabilizers (Column 1, Lines 50-67 and Column 8, Lines 25-29). The reference discloses that the combination of polyacetal resin and the olefinic polymers results in a resin compositions having excellent general properties and sliding performances (Column 1, Lines 50-56).

Given that both Yamamoto et al and Tajima et al are drawn to polyacetal resins containing additives such as stabilizers, in light of the particular advantages provided by the use and control of the olefinic polymer as taught by Tajima et al, it would therefore have been obvious to one of ordinary skill in the art to include such polymers in the composition disclosed by Yamamoto et al in order to obtain a polyoxymethylene resin composition which has improved material and sliding properties.

35. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al (US 5,886,139) as evidenced by the *Merck Index* (see attached pages) as applied to claims 1-6, 8-9, 12, 16-17, and 19-20 above and further in view of Harashina (US 2003/0158301).

Regarding claim 24, Yamamoto teaches all the claim limitations as set forth above. However, Yamamoto does not disclose a pellet of polyacetal resin comprising a formaldehyde emission inhibitor.

Harashina discloses a polyacetal resin in the form of a pellet which formaldehyde emission inhibitor compounds such as glyoxyldiureide compounds and basic nitrogen compounds which not only inhibit formaldehyde emission but also provides a polyacetal resin with improved process stability (Page 2, [0013]-[0016], Page 3, [0026], Page 5, [0054]).

Given that both Yamamoto and Harashina are drawn to polyoxymethylene resins comprises stabilizers, in light of the particular advantages provided by the use and control of the glyoxyldiureide compounds and basic nitrogen compounds as taught by Harashina, it would therefore have been obvious to one of ordinary skill in the art to include such compounds in the

composition disclosed by Yamamoto in order to improve polyacetal resin processes stability and inhibit formaldehyde emission.

### ***Double Patenting***

36. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

37. Claims 1-5 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1 and 17 of copending Application No. 11/808,124 (published as US PGPub 2008/0271381) as evidenced by the *Merck Index* (see attached pages. Although the conflicting claims are not identical, they are not patentably distinct from each other because of the reasons given below.

Claims 1, 8, and 17 of copending Application No. 11/808,124 recite a method manufacturing a polyacetal resin and a polyacetal resin composition comprising trioxane. While the co-pending application does not claim that the trioxane contents is less than 100 to less than 10 ppm as recited in the instant claims 1-4, note that Page 31 of the Specification discloses that

the polyacetal resin is heat treated at a temperature between the melting point of the resin and 260 degrees C. Case law holds that those portions of the specification which provide support for the patent claims may also be examined and considered when addressing the issue of whether a claim in an application defines an obvious variation of an invention claimed in the patent. In re Vogel, 422 F.2d 438, 164 USPQ 619,622 (CCPA 1970).

It is the Examiner's position that the disclosed temperature range and process of heat-melting the polymer meet the presently claimed limitations drawn to reducing trioxane content reduced via heat treatment recited in claims 1-5. Evidence to support this position is found in the *Merck Index* which discloses that the boiling point of trioxane is 114.5 degrees (Page 9860, entry 9863). Given that the reference discloses that heat treatment of the copolymer occurs at a temperature range from the melting point of the polymer to 250 degrees C, it is clear that residual trioxane monomers will be removed.

The scope of the instant claims encompasses the scope of the claims in copending Application No. 11/808,124.

38. Claims 1-5 are directed to an invention not patentably distinct from claims 1, 8, and 17 of commonly assigned application. Specifically, see the discussion set forth above in paragraph 37.

The U.S. Patent and Trademark Office normally will not institute an interference between applications or a patent and an application of common ownership (see MPEP Chapter 2300). Commonly assigned application, discussed above, would form the basis for a rejection of the noted claims under 35 U.S.C. 103(a) if the commonly assigned case qualifies as prior art under

35 U.S.C. 102(e), (f) or (g) and the conflicting inventions were not commonly owned at the time the invention in this application was made. In order for the examiner to resolve this issue, the assignee can, under 35 U.S.C. 103(c) and 37 CFR 1.78(c), either show that the conflicting inventions were commonly owned at the time the invention in this application was made, or name the prior inventor of the conflicting subject matter.

A showing that the inventions were commonly owned at the time the invention in this application was made will preclude a rejection under 35 U.S.C. 103(a) based upon the commonly assigned case as a reference under 35 U.S.C. 102(f) or (g), or 35 U.S.C. 102(e) for applications pending on or after December 10, 2004.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Conclusion***

39. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER C. KOLLIAS whose telephone number is (571)-270-3869. The examiner can normally be reached on Monday-Friday, 8:00 AM -5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vasu Jagannathan can be reached on (571)-272-1119. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. C. K./  
Examiner, Art Unit 1796

/Vasu Jagannathan/  
Supervisory Patent Examiner, Art Unit 1796